

## Contents:

Introduction xxxi Acknowledgments xxxiii About the Author xxxv Chapter 1: Text 1 1.1 string: Text Constants and Templates 1 1.2 textwrap: Formatting Text Paragraphs 7 1.3 re: Regular Expressions 13 1.4 difflib: Compare Sequences 58 Chapter 2: Data Structures 65 2.1 enum: Enumeration Type 66 2.2 collections: Container Data Types 75 2.3 array: Sequence of Fixed-Type Data 98 2.4 heapq: Heap Sort Algorithm 103 2.5 bisect: Maintain Lists in Sorted Order 109 2.6 queue: Thread-Safe FIFO Implementation 111 2.7 struct: Binary Data Structures 117 2.8 weakref: Impermanent References to Objects 121 2.9 copy: Duplicate Objects 130 2.10 pprint: Pretty-Print Data Structures 136 Chapter 3: Algorithms 143 3.1 functools: Tools for Manipulating Functions 143 3.2 itertools: Iterator Functions 163 3.3 operator: Functional Interface to Built-in Operators 183 3.4 contextlib: Context Manager Utilities 191 Chapter 4: Dates and Times 211 4.1 time: Clock Time 211 4.2 datetime: Date and Time Value Manipulation 221 4.3 calendar: Work with Dates 233 Chapter 5: Mathematics 239 5.1 decimal: Fixed- and Floating-Point Math 239 5.2 fractions: Rational Numbers 250 5.3 random: Pseudorandom Number Generators 254 5.4 math: Mathematical Functions 264 5.5 statistics: Statistical Calculations 290 Chapter 6: The File System 295 6.1 os.path: Platform-Independent Manipulation of Filenames 296 6.2 pathlib: File System Paths as Objects 305 6.3 glob: Filename Pattern Matching 319 6.4 fnmatch: Unix-Style Glob Pattern Matching 323 6.5 linecache: Read Text Files Efficiently 326 6.6 tempfile: Temporary File System Objects 330 6.7 shutil: High-Level File Operations 337 6.8 filecmp: Compare Files 351 6.9 mmap: Memory-Map Files 361 6.10 codecs: String Encoding and Decoding 365 6.11 io: Text, Binary, and Raw Stream I/O Tools 390 Chapter 7: Data Persistence and Exchange 395 7.1 pickle: Object Serialization 396 7.2 shelve: Persistent Storage of Objects 405 7.3 dbm: Unix Key-Value Databases 408 7.4 sqlite3: Embedded Relational Database 412 7.5 xml.etree.ElementTree: XML Manipulation API 445 7.6 csv: Comma-Separated Value Files 466 Chapter 8: Data Compression and Archiving 477 8.1 zlib: GNU zlib Compression 477 8.2 gzip: Read and Write GNU zip Files 486 8.3 bz2: bzip2 Compression 491 8.4 tarfile: Tar Archive Access 503 8.5 zipfile: ZIP Archive Access 511 Chapter 9: Cryptography 523 9.1 hashlib: Cryptographic Hashing 523 9.2 hmac: Cryptographic Message Signing and Verification 528 Chapter 10: Concurrency with Processes, Threads, and Coroutines 535 10.1 subprocess: Spawning Additional Processes 535 10.2 signal: Asynchronous System Events 553 10.3 threading: Manage Concurrent Operations Within a Process 560 10.4 multiprocessing: Manage Processes Like Threads 586 10.5 asyncio: Asynchronous I/O, Event Loop, and Concurrency Tools 617 10.6 concurrent.futures: Manage Pools of Concurrent Tasks 677 Chapter 11: Networking 687 11.1 ipaddress: Internet Addresses 687 11.2 socket: Network Communication 693 11.3 selectors: I/O Multiplexing Abstractions 724 11.4 select: Wait for I/O Efficiently 728 11.5 socketserver: Creating Network Servers 742 Chapter 12: The Internet 753 12.1 urllib.parse: Split URLs into Components 753 12.2 urllib.request: Network Resource Access 761 12.3 urllib.robotparser: Internet Spider Access Control 773 12.4 base64: Encode Binary Data with ASCII 776 12.5 http.server: Base Classes for Implementing Web Servers 781 12.6 http.cookies: HTTP Cookies 790 12.7 webbrowser: Displays Web Pages 796 12.8 uuid: Universally Unique Identifiers 797 12.9 json: JavaScript Object Notation 803 12.10 xmlrpc.client: Client Library for XML-RPC 816 12.11 xmlrpc.server: An XML-RPC Server 827 Chapter 13: Email 841 13.1 smtplib: Simple Mail Transfer Protocol Client 841 13.2 smtpd: Sample Mail Servers 847 13.3 mailbox: Manipulate Email Archives 852 13.4 imaplib: IMAP4 Client Library 864 Chapter 14: Application Building Blocks 887 14.1 argparse: Command-Line Option and Argument Parsing 888 14.2 getopt: Command-Line Option Parsing 916 14.3

readline: The GNU readline Library 922 14.4 getpass: Secure Password Prompt 935 14.5 cmd:  
Line-Oriented Command Processors 938 14.6 shlex: Parse Shell-Style Syntaxes 951 14.7  
configparser: Work with Configuration Files 960 14.8 logging: Report Status, Error, and  
Informational Messages 980 14.9 fileinput: Command-Line Filter Framework 986 14.10 atexit:  
Program Shutdown Callbacks 993 14.11 sched: Timed Event Scheduler 998 Chapter 15:  
Internationalization and Localization 1003 15.1 gettext: Message Catalogs 1003 15.2 locale:  
Cultural Localization API 1012 Chapter 16: Developer Tools 1023 16.1 pydoc: Online Help for  
Modules 1024 16.2 doctest: Testing Through Documentation 1026 16.3 unittest: Automated  
Testing Framework 1051 16.4 trace: Follow Program Flow 1069 16.5 traceback: Exceptions and  
Stack Traces 1078 16.6 cgitb: Detailed Traceback Reports 1089 16.7 pdb: Interactive Debugger  
1101 16.8 profile and pstats: Performance Analysis 1140 16.9 timeit: Time the Execution of  
Small Bits of Python Code 1148 16.10 tabnanny: Indentation Validator 1153 16.11 compileall:  
Byte-Compile Source Files 1155 16.12 pylbr: Class Browser 1160 16.13 venv: Create Virtual  
Environments 1163 16.14 ensurepip: Install the Python Package Installer 1167 Chapter 17:  
Runtime Features 1169 17.1 site: Site-wide Configuration 1169 17.2 sys: System-Specific  
Configuration 1178 17.3 os: Portable Access to Operating System-Specific Features 1227 17.4  
platform: System Version Information 1246 17.5 resource: System Resource Management 1251  
17.6 gc: Garbage Collector 1254 17.7 sysconfig: Interpreter Compile-Time Configuration 1270  
Chapter 18: Language Tools 1279 18.1 warnings: Non-fatal Alerts 1279 18.2 abc: Abstract Base  
Classes 1287 18.3 dis: Python Byte-Code Disassembler 1296 18.4 inspect: Inspect Live Objects  
1311 Chapter 19: Modules and Packages 1329 19.1 importlib: Python's Import Mechanism 1329  
19.2 pkgutil: Package Utilities 1334 19.3 zipimport: Load Python Code from ZIP Archives 1344  
Appendix A: Porting Notes 1351 A.1 References 1351 A.2 New Modules 1352 A.3 Renamed  
Modules 1352 A.4 Removed Modules 1354 A.5 Deprecated Modules 1355 A.6 Summary of  
Changes to Modules 1356 Appendix B: Outside of the Standard Library 1367 B.1 Text 1367 B.2  
Algorithms 1367 B.3 Dates and Times 1368 B.4 Mathematics 1368 B.5 Data Persistence and  
Exchange 1368 B.6 Cryptography 1369 B.7 Concurrency with Processes, Threads, and  
Coroutines 1369 B.8 The Internet 1369 B.9 Email 1370 B.10 Application Building Blocks 1370  
B.11 Developer Tools 1371 Index of Python Modules 1373 Index 1375